almega Manufacturing

Maryland Technology Extension Service

Almega Manufacturing Employs Higher Math To Elevate The Product

Client Profile:
Almega Manufacturing designs and manufactures residential wooden stair and handrail systems. The company plant is located in Westminster, Maryland. Founded in 1946, Almega Manufacturing is owned and operated by members of the McAndrew family. The company currently employs approximately 50 people, and annual sales range from five to ten million dollars. Custom configurations, new stair designs, and innovations in manufacturing methods have been continuously introduced throughout the company's history.

Situation:
Almega Manufacturing had nearly completed the in-house programming of an order configurator and expert system for residential, wood stair manufacturing. Order configuration data is entered by the sales staff, and directly outputs bills of materials, routers, G-code for operation of CNC mills making parts, and all the information the shop needs to make piece parts and assemble them conveniently on bench tops.
The expert system for straight stairs is complete and has functioned successfully for some time. The system eliminates the need for assemblers to measure or layout work. The CNC machine makes the parts to size for that order, and the assemblers simply staple parts together. The expert system is continuing to evolve to accommodate circular stairs, including the development of a method of positioning circular stair piece parts during assembly.
Progress had been made to the point of choosing to support each tread of the circular stair with two tripod stands. Circular stairs often include straight steps at the top, bottom or both ends of a set. However, Almega could not decide how tall each stand should be to support the stair set parts upside down while they are stapled together into a single structure. The company contacted the Maryland Technology Extension Service (MTES), a NIST MEP network affiliate located at the University of Maryland, for assistance.

Solution:
MTES provided an engineer to work on Almega Manufacturing's dilemma. MTES visited the plant and studied the problem of supporting a circular stair while it is assembled on the shop floor. MTES found a solution to the problem by discovering two vectors defined by four points inherent to any circular stair system. By using vector calculus methods regarding planes in space, the complete problem is solved.

Employing the developed methodology, MTES determined stand heights for an existing order and visited the plant to assist in the implementation of the method. MTES also recommended installation of the existing inventory of tripod stands to allow for the variation in relative angular position of the parts to the stand. Both the classical solution to the problem in long hand and a spread sheet using the method were shared with Almega Manufacturing's programmer for future inclusion in the expert system.

Results:
Developed a mathematical solution to a complex assembly problem.
Increased number of production units using the method.
Increased productivity and quality.
Forecasting a 180 percent increase in growth.

Testimonial:

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